

## CLAIMS

What is claimed is:

1    1. An annular seal assembly for providing a fluid seal between an active  
2    pressure differential device and a wellbore sidewall, the seal assembly  
3    comprising:

4                 a selectively inflatable seal element that is actuatable between a  
5                 first position wherein the seal element is uninflated and a second position  
6                 wherein the seal is inflated to provide a fluid seal; and

7                 a hydraulic inflation system for selective actuation of the seal  
8                 element between its first and second positions.

1    2. The annular seal assembly of claim 1 wherein the hydraulic inflation  
2    system comprises a fluid buffer to protect the inflatable element from excessive  
3    inflation forces.

1    3. The annular seal assembly of claim 1 wherein the annular seal assembly  
2    is actuated by flow of drilling mud.

1    4. The annular seal assembly of claim 1 wherein the hydraulic inflation  
2    system comprises a hydraulic fluid chamber having an open end that is exposed  
3    to drilling mud flow, the drilling mud flow providing a fluid pressure source for  
4    inflation of the seal element to its inflated position.

1    5. The annular seal assembly of claim 2 wherein the fluid buffer comprises a  
2    compressible spring for absorbing excessive fluid pressures.

1    6. The annular seal assembly of claim 1 wherein the seal element is at least  
2    partially coated with a lubricant to facilitate movement of the seal element within  
3    a wellbore.

1   7.   The annular seal assembly of claim 1 wherein the seal element comprises  
2   an elastomeric inflatable packer.

1   8.   The annular seal assembly of claim 4 wherein the open end of the  
2   hydraulic fluid chamber is located on a radial exterior of said active pressure  
3   differential device to receive drilling mud that is returning to a surface of a well.

1   9.   The annular seal assembly of claim 4 wherein the open end of the  
2   hydraulic fluid chamber is located on a radial interior of said active pressure  
3   differential device to receive drilling mud that is being pumped downward through  
4   the active pressure differential device.

1   10.   A system for providing an active pressure differential within a wellbore, the  
2   system comprising:

3                 an active pressure differential device having an outer housing and  
4                 a fluid pump component;

5                 an annular seal assembly for providing a fluid seal between the  
6                 housing of the active pressure differential device and a wellbore sidewall,  
7                 the seal assembly comprising:

8                 a selectively inflatable seal element that is actuatable between a  
9                 first position wherein the seal element is uninflated and a second position  
10                wherein the seal is inflated to provide a fluid seal; and

11                a hydraulic inflation system for selective actuation of the seal  
12                element between its first and second positions, the hydraulic inflation  
13                system comprising a hydraulic fluid chamber having an open end that is  
14                exposed to drilling mud flow, the drilling mud flow providing a fluid  
15                pressure source for inflation of the seal element to its inflated position.

1   11.   The system of claim 10 wherein the hydraulic inflation system further  
2   comprises a buffer for absorbing excessive inflation pressures.

1       12. The system of claim 10 wherein the hydraulic inflation system further  
2       comprises a pair of cylinders, each of the cylinders being in fluid communication  
3       with the seal element and each of the cylinders contains a spring.

1       13. The system of claim 12 wherein the cylinders are in fluid communication  
2       with each other

1       14. The system of claim 10 wherein the seal element comprises an annular  
2       elastomeric packer element that is integrated into a housing of the active  
3       pressure differential device.

1       15. The system of claim 10 wherein the active pressure differential device  
2       comprises a pump.

1       16. A system for providing an active pressure differential within a wellbore, the  
2       system comprising:

3                 an active pressure differential device having an outer housing and  
4                 a fluid pump component;

5                 an annular seal assembly for providing a fluid seal between the  
6                 housing of the active pressure differential device and a wellbore sidewall,  
7                 the seal assembly comprising:

8                         a seal element that is set against the wellbore sidewall to  
9                 provide a fluid seal, and

10                  a fluid passage that allows wellbore fluids to bypass the seal  
11                 element as the active pressure differential device and  
12                 annular seal assembly are run into the wellbore.

1       17. The system of claim 16 wherein the fluid passage comprises a trip valve  
2       that permits one way fluid flow.

1   18. The system of claim 16 wherein the seal element comprises a radially  
2 deformable mud cup.

1   19. The system of claim 16 wherein the seal element is set by rotation of a  
2 sleeve element to preclude fluid flow through the fluid passage.

1   20. A method of providing a seal between an active pressure differential  
2 device and a cased borehole wall, the method comprising the steps of:

3                 disposing an active pressure differential device into a wellbore to a  
4 desired depth, the active pressure differential device having a fluid pump  
5 and a radially outer housing, the active pressure differential device further  
6 having an annular seal element upon the outer housing;

7                 setting the seal element to provide a fluid seal between the active  
8 pressure differential device and the cased borehole wall.

1   21. The method of claim 20 wherein the seal element is inflated by flowing  
2 drilling fluid into the active pressure differential device and returning it to the  
3 surface of the wellbore.

1   22. The method of claim 20 further comprising the step of buffering the seal  
2 element against excessive inflation pressures.

1   23. The method of claim 20 wherein the step of setting the seal element  
2 further comprises receiving drilling fluid pressure into a hydraulic chamber within  
3 the housing, said drilling fluid pressure then being used to inflate the seal  
4 element.

1   24. The method of claim 20 wherein the step of setting the seal element  
2 comprises setting a radially deformable seal against the cased borehole wall.

1    25. The method of claim 20 wherein the radially deformable seal is set against  
2    the cased borehole by a pressure differential across the annular seal element.

1    26. The method of claim 20 wherein the step of setting the seal element  
2    comprises radially expanding a seal portion under spring bias to engage the  
3    cased borehole wall.

1    27. The method of claim 20 wherein the step of setting the seal element  
2    further comprises axially moving a sliding sleeve to permit the seal portion to  
3    expand radially into engagement with the cased borehole wall.

1    28. The method of claim 20 wherein the step of disposing the active pressure  
2    differential device into the wellbore further comprises allowing wellbore fluids to  
3    bypass the seal element as the active pressure differential device is disposed  
4    into the wellbore.

1    29. The method of claim 28 wherein wellbore fluids are passed through a trip  
2    valve to bypass the seal element.